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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/812,066	03/30/2004	Michael Walker	Q80461	1314
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EXAMINER				
LEE, PING				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/812,066

**Applicant(s)**

WALKER, MICHAEL

**Examiner**

Ping Lee

**Art Unit**

2614

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 December 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 11-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/5508)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 12-18 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 12 and 16-18 introduce new matter because claim 12 has been amended to have a computer readable recording medium having recorded thereon a program for executing a method of claim 1. The specification and the drawings as originally filed fails to disclose and support such limitation.

Claims 13 and 14 introduce new matter because claim 1 has been amended to specify "first virtual microphone signal corresponds to a direct sound without any time delay". The specification as originally filed defines that only one virtual microphone signal is being treated as a direct sound without any delay. See Fig. 1, S1 is the only direct sound without the delay. See Fig. 2, S1 represents the only direct sound without any delay. Since claim 1 already defines the direct sound as the first virtual microphone sound, all other virtual microphone signals do not represent direct sound. Accordingly, all other virtual microphone signals include delay. The amended claim 13 defines that

the last virtual sound is not delayed. This simply creates conflict with the limitation "the first virtual microphone signal corresponds to a direct sound" as defined in claim 1.

Claim 15 has a similar defect with respect to claim 11. Claim 17 has a similar defect with respect to claim 1.

***Claim Rejections - 35 USC § 102***

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
4. Claims 1-5, 8, 11, 13-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Tazawa et al. (hereafter Tazawa) ("A Fully Passive Echo-Canceler using a Single Microphone").

Regarding claims 1 and 11, Tazawa discloses a method and a device for enhancing the quality of a received acoustic signal, wherein the acoustic signal has been generated by a single microphone (p. 1191, "Basic Idea"), wherein acoustic signal is subjected to an analysis of characteristics, the method comprising:

estimating a plurality of virtual microphone signals ( $A_1s(t-\tau_1)$ ,  $A_2s(t-\tau_2)$ ) and so on; see equation 1) using the analysis, from the acoustic signal ( $m(t)$ ) wherein the plurality of virtual microphone signals (virtual means existing in the mind, especially as a product of the imagination; the claimed virtual microphone signals read echo 1 and echo 2 because echo 1 and echo are simulated signals representing the original echo) are free of reverberation( the terms  $A_1s(t-\tau_1)$ , and  $A_2s(t-\tau_2)$  represent the direct sound at the time  $\tau_1$  and  $\tau_2$  respectively; see Fig. 1; the terms  $A_1s(t-\tau_1)$ , and  $A_2s(t-\tau_2)$  themselves do not

include reverberation) and the first virtual microphone signal corresponds to a direct sound without any time delay ( $s(t)$ ), and wherein an  $n$ -th virtual microphone signal is obtained using a time delay  $d_n$  ( $\tau_1$  or  $\tau_2$  depending on whether it is for the first or second term after the direct sound) that is a time period between an onset of an  $(n-1)$ -th reverberation sound of the acoustic signal and an onset of an  $n$ -th reverberation sound of the acoustic signal (p. 1191, under "Basic Idea", the term has been defined under equation 1), the  $n$  being an integer equal or greater than 2;

delaying each of the plurality of virtual microphone signals ( $A_1s(t)$ ,  $A_2s(t)$ ) by a different respective period of time ( $\tau_1$ ,  $\tau_2$ ); and

adding the delayed each of the plurality of virtual microphone signals to produce an output signal (by the summation as in  $m(t)$  in equation 1 or  $s(t)$  in equation 2).

Regarding claim 2, as shown in Fig. 1, at time  $\tau_1$ , the onset of a first reverberation sound occurred, the term in the equation shows the delay ( $\tau_1$ ) and the modification parameter (coefficient  $A_1$ ). The acoustic signal is subtracted by the modified delay signal (equation 7), and the first virtual microphone signal is subjected to an analysis to generate one or several analysis parameters (step 2 and p. 1193), and the modification parameters are adapted within a feedback loop to optimize the first virtual microphone signal by minimizing overall amplitude of the first virtual microphone signal (see the comparison between Fig. 6 and Fig. 8).

Regarding claim 3, the claimed amplifying reads on  $A_1$ .

Regarding claim 4, Tazawa shows that more than one echo is being canceled, and two separate delays are used to simulation in the experiment disclosed on p. 1193.

Regarding claim 5, Tazawa shows the step of summation (see equation 6 for example), the undelayed virtual microphone signal is the direct sound.

Regarding claim 8, Tazawa shows the Fourier transform and the frequency domain.

In view of 112, 1<sup>st</sup> paragraph rejection above, the claims identified below are being rejected under broadest interpretation.

Regarding claims 13 and 15, in the delaying each of the plurality of virtual microphone signals, Tazawa show that a first virtual microphone signal (corresponds to a direct signal) is not delayed, and wherein the different respective period of time decreases when applied to delay the plurality of virtual microphone signals from the second to the last virtual microphone signals (as shown in equation 1 and Fig. 1,  $A_1s(t-\tau_1)$ , and  $A_2s(t-\tau_2)$  have delays,  $\tau_2$  is longer than  $\tau_1$ ).

Regarding claims 14 and 16, as shown in Fig. 1, the claimed second virtual microphone signal reads on  $A_1s(t-\tau_1)$ , and the last reverberation sound reads on  $A_2s(t-\tau_2)$ .

### ***Claim Rejections - 35 USC § 103***

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
6. Claims 6, 7, 12, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tazawa.

Regarding claim 6, Tazawa fails to show a FIR unit. However, based on Tazawa's teaching, the enhanced audio signal is generated by calculating steps involving delay, multiplication and summation. One skilled in the art would have recognized that such calculation could be performed using a FIR filter. Examiner takes Official Notice that this feature is notoriously well known in the art. Thus, it would have been obvious to one of ordinary skill in the art to modify Tazawa by implementing the calculation using well known FIR filter in order to obtain the enhanced audio signal.

Regarding claim 7, Tazawa fails to show a least mean square method and/or a normalized least mean square method. However, based on Tazawa's teaching, one has to minimize the difference between estimate amplitude  $A'$  and the actual amplitude  $A$  in order to find a solution that closely resembles the original signal. One skilled in the art would have recognized that such calculation could be performed by a least mean square method and/or a normalized least mean square method. Examiner takes Official Notice that this feature is notoriously well known in the art. Thus, it would have been obvious to one of ordinary skill in the art to modify Tazawa by utilizing a least mean square method and/or a normalized least mean square method in order to obtain the best amplitude  $A'$  for calculating the enhanced audio signal.

Regarding claims 12, 17 and 18, Tazawa fails to explicitly show a computer readable recording medium. However, Tazawa teaches a simulation performed using a male voice. The data analysis is performed and the graphs are shown. The analysis involves the cepstrum which is best performed using a computer with instruction stored

in a computer readable recording medium. Therefore, it would have been obvious to one of ordinary skill in the art to modify Tazawa by using a computer to perform the simulation in order to determine how effective the echo and/or reverberation being canceled.

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tazawa in view of Dear et al (hereafter Dear) (US 4,832,147).

Regarding claim 9, Tazawa teaches how to measure the time delay in Fig. 1 by observing the edge of the signal amplitude following a timer period of substantially constant signal amplitude. However, Tazawa fails to explicitly show the limited frequency interval. Tazawa teaches that echo and/or reverberation in a stadium would make it difficult to distinguish speech (see "INTRODUCTION"). Dear teaches that, without echo cancellation, the intelligibility of an audio signal at 100 Hz inside a gymnasium is unacceptable (col. 3, lines 37-48). Thus, it would have been obvious to one of ordinary skill in the art to modify Tazawa in view of Dear to measure the time delay at 100 Hz in order to design the echo cancellation for reducing the echo in a gymnasium or other similar enclosure.

#### ***Election/Restrictions***

8. Applicant is being reminded that an election without traverse of species II, Fig. 5 was filed on 10/23/07.



***Response to Arguments***

9. Applicant's arguments filed 12/16/08 have been fully considered but they are not persuasive.

Applicant stated claim 12 does not introduce new matter because the original claim 12 specifies:

A computer terminal comprising an input for a received acoustic signal, in particular a microphone and/or a data carrier device and/or a data line, an output for an enhanced quality acoustic signal, in particular a loudspeaker and/or a data carrier device and/or a data line, and means for performing a method according to claim 1.

This is not persuasive. Applicant fails to point out specific portion in the drawings and the specification original filed to support the newly amended claim 12. Original claim 12 does not cure the deficiency. "A computer terminal comprising an input for a received acoustic signal" does not provided sufficient support to enable one skilled in the art to have an invention as "a computer readable recording medium having recorded thereon a program for executing a method of claim 1" as in the amended claim 12. Applicant has not disclosed what the data carrier device is. Applicant also fails to disclose what data line is. To be simply put, one skilled in the art would not be able to see the connection between data carrier, data line and the computer line in original claim 12 to a computer readable recording medium having recording thereon a program for executing a method of claim 1 as specified in the newly amended claim 12. Applicant stated that a computer terminal comprising an element (means) for performing the method of claim 1. First of all, if applicant wants to evoke 112, sixth paragraph, the

specification and the drawing as originally filed fails to define what the element (means) is. Secondly, an element (means) could be any device as long as it performs the function. One skilled in the art would not be able to define that the element (means) is a computer readable recording medium having recorded thereon a program for executing a method of claim 1 without applicant introducing new matter to the original disclosure. Examiner does not ask applicant to provide the exact words in the specification to support the newly amended claim 12. Examiner is looking for support in the disclosure to support the limitation in the newly amended claim 12. There is none. Applicant mentioned Fig. 3. One skilled in the art, when studying Fig. 3 with its corresponding text, would not be able to see the invention as specified in the newly amended claim 12.

In response to 102 prior art rejection, applicant indicated that Tazawa fails to show that all the claimed virtual (microphone) signal does not include reverberation. This is bizarre. The purpose of Tazawa is to remove the reverberation from the received signal at the single microphone (see abstract). In order to achieve this objective, Tazawa subtract all the reverberation components from the microphone signal (see equation 2). Applicant, as illustrated in Figs. 1 and 2, is using the similar approach. The received signal  $S$  at the single microphone is the combination of a direct signal ( $S_1$ ) and the reverberation components  $S_2$  and  $S_3$ . Note the similarity between equation 2 in the instant application and equation 2 of Tazawa. It is clearly shown in equation 2 in Tazawa that the clean signal is generated by subtracting the microphone signal from the summation of all reverberation components. In Fig. 2, applicant illustrates that it takes longer for the reverberation components,  $S_2^*$  and  $S_3^*$ , to reach

the microphone comparing with the direct signal  $S1^*$ . In Fig. 1, Tazawa also provides an illustration to show the time delay between the direct signal and the reverberation components. Each reverberation component in Tazawa, echo 1 or echo 2, represents the original direct signal being delayed, just like  $S2$  or  $S3$  of the instant application. Echo 1 or echo 2 in Tazawa does not include any other reverberation. The coefficient before each term represents how much amplitude being attenuation after being traveled in a longer distance than the original direct signal. There is also coefficient for  $S2^*$  and  $S3^*$  in the instant application. See paragraphs 27, 30 and 34 for example. Just like to instant application, the estimated  $A_1s(t-\tau_1)$ , and  $A_2s(t-\tau_2)$  are not real signals. They closely resemble the original echo. Therefore, the estimated  $A_1s(t-\tau_1)$ , and  $A_2s(t-\tau_2)$  can be read as the claimed virtual microphone signal. In the experiment performed in Tazawa is very simple. For example, there are only three components in the microphone signal in experiment 1. They are a male voice and its two echoes. No other sound is presented.

Applicant argued that the amplitude for echo 1 and echo 2 indicates that additional elements, such as reverberation are being added to echo 1 and echo 2. This is not what Tazawa discloses. One skilled in the art reading Tazawa as a whole would clearly understand that echo 1 and echo 2 are the echoes of the original signal. Echo 1 itself does not have any other echo component, so as echo 2. Due to the nature of the sound traveling, the echo 1 and echo 2 will not have the same amplitude as the original signal because of longer distance and/or absorption factor in the environment.

Similarly, the instant application discloses the amplitude for each virtual microphone signal and the time delay with respect to the original signal.

The signal  $m(t)$  in Tazawa is the microphone signal. The purpose of Tazawa is to remove echo from the microphone signal, so the remaining signal is more closely resemble the direct signal. See equation 1 in Tazawa. The microphone signal is the combination of the direct signal and the echoes. Just like Fig. 1 and equation 1 of the present invention. In equation 2, Tazawa discloses the microphone signal is being subtracted from the estimated echo, so the direct signal would be derived. This is exactly what equation 2 of the instant application disclosed. The output signal in Tazawa could be  $s(t)$  or  $m(t)$ .

Applicant also stated that an output signal is not indicated as including a direct sound. Examiner would like to ask applicant to explain, for example, the preamble of claim 1. If the output signal does not include a direct sound, how would the claimed method enhance the quality of a received acoustic signal. Furthermore, by adding all the virtual microphone signals, wherein the first virtual microphone signal corresponds to a direct sound, how could applicant stating that the output signal does not include a direct sound?

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ping Lee whose telephone number is 571-272-7522. The examiner can normally be reached on Wednesday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian C. Chin can be reached on 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ping Lee/  
Primary Examiner, Art Unit 2614

pwl